

# Driving deaths and injuries post-9/11

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**Objectives:** In the days immediately following the terror attacks of 9/11, thousands of Americans chose to drive rather than to fly. We analyzed highway accident data to determine whether or not the number of fatalities and injuries following 9/11 differed from those in the same time period in 2000 and 2002.

**Methods:** Motor crash data from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System were analyzed to determine the numbers and rates of fatalities and injuries nationally and in selected states for the 20 days after September 11, in each of 2000, 2001, and 2002.

**Results:** While the fatality rate did not change appreciably, the number of less severe injuries was statistically higher in 2001 than in 2000, both nationally and in New York State.

**Conclusions:** The fear of terror attacks may have compelled Americans to drive instead of fly. They were thus exposed to the heightened risk of injury and death posed by driving. The need for public health to manage risk perception and communication is thus heightened in an era of global fear and terrorism.

**Keywords:** public health, traffic, injuries, epidemiology

## Introduction

In the weeks and months immediately following the New York and Washington terror acts of September 11, 2001, millions of Americans decreased their domestic air travel.<sup>1</sup> At the same time, Americans' reliance on car travel, measured in terms of miles traveled via automobile, increased by up to 5.3% on interstate highways,<sup>2</sup> suggesting that long-distance travel had increased. In other words, it seems likely that people were opting to drive long distances rather than flying, for fear of the risk of terrorism-related death in airplanes.

According to data from the National Transportation Safety Board website,<sup>3</sup> in 2001 there were a total of 331 airplane crash-related fatalities in the US, not including the 9/11 terror attacks, out of 1751 crash events. This is compared to 354 deaths the previous year, out of 1862 events. At the same time, there were 42,000–44,000 driving-related deaths in each of 2000, 2001, and 2002.<sup>4</sup> Even when computed as a rate of trips taken, flying is the statistically safer mode of long-distance travel.<sup>5</sup>

These statistics imply that, en masse, Americans immediately post-9/11 were more inclined to brave the real mortality risks of long-distance car travel, rather than to adopt the minimal risk of air travel, presumably due to terrorism's inflation of the perception of that risk. Myers<sup>6</sup> was the first to propose that the psychological effects of the 9/11

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terror acts might result in a secondary toll of deaths as people made poor choices to avoid wrongfully perceived scenarios of risk.

Gigerenzer<sup>7</sup> tested this supposition by looking at aggregate US traffic fatality rates in the 3 months of 2001 after 9/11 and comparing them to previous years. He concluded that there were approximately 353 excess fatalities caused by people choosing to drive when they would have otherwise flown.

The present study was conceived in order to confirm and deepen Gigerenzer's analysis by adding injuries (not just fatalities) to the outcome measure, by limiting comparisons to the year before and the year after 2001, further restricting focus to the weeks immediately after 9/11, and by focusing additionally on New York State, the District of Columbia, Virginia, and Pennsylvania, which were the areas directly affected by the 9/11 terror attacks. Our intent was to explore whether or not Gigerenzer's findings<sup>7</sup> were an artefact of his methodology, whether changed behaviors may have manifested as an altered injury rate as well as an altered fatality rate, and to engage in a discussion of the nature of risk perception in a public health and media context.

## Methods

Using free raw data from the Fatality Analysis Reporting System (FARS) of the National Highway Traffic Safety Administration,<sup>8</sup> we extracted the following variables pertaining to police-reported motor vehicle crashes: year (2000, 2001, and 2002), the state in which the crash took place, the date of the crash, the number of fatalities in the crash, the number injured in the crash, and the severity of their injuries. FARS was created by the National Highway Traffic Safety Administration. It contains data on a census of fatal traffic crashes within the 50 states, the District of Columbia, and Puerto Rico.

Our methodology differed considerably from that of Gigerenzer. The latter looked at a trend in monthly average deaths from 1996 to the end of 2001, and computed the deviation from the mean in the 3 months after 9/11.<sup>7</sup> We, on the other hand, looked solely at the days in the month of September after the 11th, and drew incident comparisons between 2000, 2001, and 2002. This was done for a number of reasons, prime among them the belief that driving patterns are seasonal, influenced by weather, work, and school patterns. Thus the most conservative approach was to reduce comparisons to a small set of days out of the year.

Tables were created to summarize the total number of fatalities or injuries by year and state. "Fatal injuries" were

distinguished from "fatalities" in that the latter were killed immediately, while the former died of injuries at a later date. (It is unclear which of the two measures was employed by Gigerenzer).<sup>7</sup> Significance testing was done using independent sample *t*-tests, comparing the means of the data from each of 2000 and 2002 to that of 2001. We selected independent *t*-tests, rather than more robust multivariate modeling methods, since this is ultimately an exploratory study meant to spur discussion and exploration of matters of risk perception and action. In the absence of additional variables for enrichment, such as demographic information, weather conditions, and vehicle characteristics, it was felt that a multivariate statistical method would not add any appreciable quality to our conclusions.

In addition to the national statistics, state-level analyses were performed for those states immediately affected by the 9/11 attacks: New York, the District of Columbia, Virginia, and Pennsylvania. Since the DC numbers were very small and therefore insufficient for proper significance testing, they were added to those of Virginia. In addition, the same analyses were performed for the state of California, as a comparator state that was not directly affected by the events of 9/11.

All analyses were performed using SPSS software (17.0; SPSS Inc, Chicago, IL).

## Results

Tables 1–5 summarize the number of car-crash fatalities and injuries reported during the last 20 days of September in 2000, 2001, and 2002, for the country as a whole, New York, Pennsylvania, California and the combined regions of Virginia and the District of Columbia. Non-incapacitating injuries nationwide and in New York State were significantly fewer in 2000 than in 2001 (Table 1); in the latter state, the increase continued into 2002, but not significantly so. And in Pennsylvania, such injuries were statistically fewer in 2002 than in 2001 (Table 4).

**Table 1** Numbers of fatalities and injuries resulting from motor vehicle crashes from September 12–31, in 2000, 2001, and 2002; USA National Data<sup>4</sup>

Year	2000	2001	2002
Fatalities	5377	5432	5544*
Incapacitating injuries	778	772	758
Fatal injuries	2330	2295	2371
Possible or non-incapacitating injury, or injury with severity unknown	1141*	1247	1211

**Notes:** \*Statistically significant findings ( $P < 0.05$ ). Fatalities refer to deaths on site, whereas fatal injuries refer to those who died within 30 days of the crash event.

**Table 2** Numbers of fatalities and injuries resulting from motor vehicle crashes from September 12–31, in 2000, 2001, and 2002; New York State<sup>4</sup>

Year	2000	2001	2002
Fatalities	182	184	207
Incapacitating injuries	25	22	23
Fatal injuries	83	76	82
Possible or non-incapacitating injury, or injury with severity unknown	32*	52	55

**Notes:** \*Statistically significant findings ( $P < 0.05$ ). Fatalities refer to deaths on site, whereas fatal injuries refer to those who died within 30 days of the crash event.

## Discussion

One flaw in Gigerenzer's approach<sup>7</sup> was to rely on the published monthly aggregate statistics for his analyses. Since the 2001 terror attacks occurred 11 days into September, the driving behaviors in the first 11 days of that month could not have been influenced by a heightened perception of air-travel risk resulting from an increased fear of terrorism. We have corrected that oversight by limiting our analyses to the 20 remaining days of September.

A second flaw was that by looking at monthly trends, Gigerenzer failed to account for the seasonal differences in driving patterns caused by weather, holidays, and social demands, such as the start or end of school terms. We avoided that pitfall by limiting our analyses to comparing the same 20 days in September in each of 2000, 2001, and 2002. And, thirdly, Gigerenzer's reliance solely on national data precluded accounting for the effects of widely differing weather patterns, road safety laws and enforcement protocols, and regional driving culture.

Our results failed to confirm Gigerenzer's findings that there were more driving fatalities in 2001 after 9/11 than would have otherwise been expected. This is likely the result of our differing scopes and methodologies, since Gigerenzer chose a broader, monthly perspective and a trend analysis rather than simple significance testing. However, whereas at the time of his study, Gigerenzer did not have access to

**Table 3** Numbers of fatalities and injuries resulting from motor vehicle crashes from September 12–31, in 2000, 2001, and 2002; combined data for Virginia and the District of Columbia<sup>4</sup>

Year	2000	2001	2002
Fatalities	103	130	98
Incapacitating injuries	34	43	24
Fatal injuries	45	58	48
Possible or non-incapacitating injury, or injury with severity unknown	6	10	11

**Notes:** There were no statistically significant findings ( $P < 0.05$ ). Fatalities refer to deaths on site, whereas fatal injuries refer to those who died within 30 days of the crash event.

**Table 4** Numbers of fatalities and injuries resulting from motor vehicle crashes from September 12–31, in 2000, 2001, and 2002; Pennsylvania<sup>4</sup>

Year	2000	2001	2002
Fatalities	22	0	13
Incapacitating injuries	42	37	33
Fatal injuries	91	87	93
Possible or non-incapacitating injury, or injury with severity unknown	42	37	33*

**Notes:** \*Statistically significant findings ( $P < 0.05$ ). Fatalities refer to deaths on site, whereas fatal injuries refer to those who died within 30 days of the crash event.

2002 data, our results indicate a significant increase at the national level of car-crash fatalities in 2002 over the 20 days after September 11.

But changes in fatality frequencies did not manifest at the state level, at least in the key states examined in this study. Instead, the more interesting finding is that non-serious injury appears to have increased in the days after 9/11, both nationally and in the state of New York. In Pennsylvania, injuries fell from 2000 to 2002, but there was a statistically significant drop from 2001 to 2002.

These data suggest that the increase in driving after 9/11 may have manifested not only in the increased fatalities detected by Gigerenzer, but also in an increased frequency of less serious injury, particularly in areas directly affected by the terror attacks. An important caveat is that we have presented frequencies, not rates. FARS does not provide an estimate of total traffic flow for a suitable denominator. However, since this paper's original point is that presumed increased traffic after 9/11 likely led to increased injuries (and perhaps deaths), then injury frequency and death frequency are indeed the correct parameters to be examined, and not injury rate or death rate.

It is, of course, spurious reasoning to associate this injury trend with attitudes toward terrorism. This is especially true since the national no-fly order was maintained for 3 days after 9/11, thus compelling Americans to use other forms of

**Table 5** Numbers of fatalities and injuries resulting from motor vehicle crashes from September 12–31, in 2000, 2001, and 2002; California<sup>4</sup>

Year	2000	2001	2002
Fatalities	492	578	551
Incapacitating injuries	48	66	57
Fatal injuries	203	216	216
Possible or non-incapacitating injury, or injury with severity unknown	116	150	128

**Notes:** There were no statistically significant findings ( $P < 0.05$ ). Fatalities refer to deaths on site, whereas fatal injuries refer to those who died within 30 days of the crash event.

transportation during those days, regardless of their fear levels. Indeed, these data might be indicative of grander trends in injury probability, having little or nothing to do with 9/11 or fear. But it is also possible that these findings are suggestive of a trope in popular risk perception. It is well established that the events of 9/11 negatively affected the mental health of Americans.<sup>9</sup> The peoples of New York and Washington may have been disproportionately more psychologically affected by 9/11 than those in the rest of the country. Indeed, at least one study suggests that Washingtonians have higher terror-related stress than other Americans,<sup>10</sup> due largely to both 9/11 and the subsequent “Beltway Sniper” murders, which were a series of seemingly random shootings in the Washington, DC, area.<sup>11</sup>

An understudied, but oft-theorized, aspect of the mental-health impact of terrorism is the probability that pre-existing psychiatric conditions, especially those that are vulnerable to emotional stress, are likely to be exacerbated.<sup>12,13</sup> Regions with a large number of psychiatric treatment centers, such as the metropolitan areas of northeast USA, are therefore at increased risk for the exacerbating effects of terrorism. It is conceivable that these effects may include poor decision-making when it comes to risk perception and the choice of long-distance travel modes, possibly even manifesting in dangerous driving behavior.

Based upon telephone surveys of New Yorkers, investigators found that, indeed, personal fears about terrorism had motivated respondents to “minimize” their risk by, among other behaviors, choosing travel methods perceived to be less vulnerable to terrorism, such as driving.<sup>12</sup> As our data suggest, these choices exposed them to a heightened risk of injury and perhaps death.

It is evident that risk perception is based more on qualitative and emotional factors than on more objective information, such as statistical assessments of safety.<sup>10</sup> A population under perceived attack is therefore more vulnerable than usual to emotionally persuasive arguments that may not be evidence based. Therefore, the responsibility of public-health workers is to develop strategies for proper and persuasive communication of true risk in an environment of agitated emotions.

Gigerenzer suggested that it is enough to simply educate the public about the psychological nature of terror threats.<sup>7</sup> To better inform such a strategy, at least one study<sup>14</sup> has called for an increased risk assessment presence and effort. While awareness of risk increases fear of it,<sup>5</sup> there is a danger in using that fact to reflexively deny the public knowledge of the true risk. It is only through appreciating

the psychology of fear that officials can best phrase their messaging to ensure the public’s safest reactions<sup>5</sup> without compromising truth.

The long-term safety statistics of various modes of travel suggest that it is irrational to avoid flying for fear of being among the very small proportion of people who die in airplane incidents, whether terror related or not. Our analyses further suggest that such irrational behavior may in fact increase the risk of injury or death. But, as stated by Huddy et al,<sup>12</sup> it may be emotionally sensible to make these seemingly irrational decisions because doing so avoids the arousal of fearful emotions, which are themselves damaging.

What is clear is that in a new era of large-scale threats to public safety, the health impact of risk perception is felt not just in the immediacy of a disaster, but long term in the form of both mental-health issues and poor decision-making. It falls to public health to improve its risk communication and management strategies.

## Disclosure

The authors report no conflicts of interest in this work.

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